IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF NEW YORK
BINGHAMTON DIVISION

STATE OF NEW YORK and THOMAS C. JORLING as Trustee of the Natural Resources,	)	
Plaintiffs,	)	**CIVIL ACTION NO. 89-CV-815** **Judge McAvoy**
v.	)	
ALLIED-SIGNAL INC.,	)	
Defendant.	)	

STATE OF NEW YORK'S DETERMINATIONS DISAPPROVING AND REVISING HONEYWELL'S REMEDIAL INVESTIGATION, BASELINE ECOLOGICAL RISK ASSESSMENT, AND HUMAN HEALTH RISK ASSESSMENT REPORTS FOR THE ONONDAGA LAKE SYSTEM

As part of the investigation of the contamination of the Onondaga Lake System with hazardous substances and ionic waste by Honeywell International Inc. ("Honeywell"; formerly AlliedSignal), and as required by the March 16, 1992 consent decree governing the Remedial Investigation/Feasibility Study ("RI/FS") for this system ("Consent Decree"), as subsequently amended, including by stipulations and orders entered by the Court on July 18, 2000 and March 19, 2001, Honeywell and its consultants prepared and submitted to the State of New York ("the State") Revised Remedial Investigation ("RI"), Baseline Ecological Risk Assessment ("BERA"), and Human Health Risk Assessment ("HHRA") Reports (hereinafter the "Honeywell Reports").

As agreed in Paragraph 2 of the May 30, 2002 stipulation and order herein ("Stipulation and Order"), the State hereby revises by determination the Honeywell Reports for the Onondaga Lake System. Pursuant to Consent Decree ¶ 42, the accompanying Revised RI, BERA, and

HHRA Reports dated December, 2002, which were originally prepared by Exponent for Honeywell, and were then revised by TAMS Consultants, Inc. for the New York State Department of Environmental Conservation (hereinafter the "State Revisions of the Honeywell Reports"), are the approved RI, BERA, and HHRA Reports for the Onondaga Lake System, subject to public comment pursuant to Consent Decree ¶ 34. The State's reasons for disapproving and revising the Honeywell Reports are summarized below. The below summaries are not exhaustive recitations of every problem identified by the State, but highlight the major reasons why the State was compelled to disapprove and revise the Honeywell Reports. The summaries should be read in conjunction with the State's Revisions of the Honeywell Reports, which are incorporated herein by reference.

I. NATURE OF THE REPORTS

A. The Remedial Investigation Report

The purpose of the remedial investigation ("RI") is, in general, to characterize the distribution of Honeywell-related substances and other substances in the Onondaga Lake System, to estimate the potential human health risks posed by mercury and other substances, and to determine the ecological significance of mercury, calcite ($CaCO_3$) deposits, and other substances in the Onondaga Lake System. The State's Revision of Honeywell's RI (as well as its revision of Honeywell's BERA and HHRA) addresses Onondaga Lake itself, to the mouths of tributaries and the Lake Outlet, and selected wetlands adjacent to Onondaga Lake. The tributaries that have been directly affected by Honeywell's waste substances are being addressed in separate studies,

such as the Geddes Brook/Ninemile Creek RI.[1] The State's Revision of Honeywell's RI has been performed in a manner consistent with the requirements of the Comprehensive Environmental Response Compensation and Liability Act, 42 U.S.C. §§ 9601 *et seq.* ("CERCLA"), the National Contingency Plan for the Removal of Oil and Hazardous Substances (*see* 40 C.F.R. Part 300) ("NCP"), and the Consent Decree, as amended.

As part of the RI Report, Honeywell was to discuss sources of contamination, identify potential migration pathways for certain contaminants, complete a conceptual site model of the sources, fate, and transport of constituents of concern, assess potential risks to human health and the environment posed by contaminants disposed of at the Site, and gather data to assist in the process of selecting a remedy for contamination at the Site.

B. Risk Assessment Reports

The assessments of potential risks to human health and the environment are major components of an RI. Under CERCLA, the selected remedy for environmental contamination must be "protective of human health and the environment." 42 U.S.C. § 9621(b). In order to comply with this requirement, documents known as human health and ecological risk assessments are created to help identify and evaluate the potential effects of contamination at a

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[1] The Consent Decree originally defined the "Onondaga Lake System" as "the waters, beds and associated biota of Onondaga Lake, such tributaries of Onondaga Lake or portions thereof as may have been contaminated by Allied's waste substances, including Geddes Brook and Nine Mile Creek, and the outlet of Onondaga Lake known as the 'Lake Outlet.'" Consent Decree ¶ 17. Since the original Consent Decree was entered in 1992, the manner in which the RI/FS work is being performed has evolved, with different parts of the Onondaga Lake System being addressed under separate RI/FS's, both pursuant to the Consent Decree and administrative consent orders between NYSDEC and Honeywell. The Determinations here thus technically encompass only a portion – albeit a significant portion – of the "Onondaga Lake System" as originally defined, with additional parts of the System being addressed separately. *See, e.g.*, Stipulation and Order, ¶ 4.

site. Information developed in an RI is subsequently used to develop a feasibility study ("FS") to aid in the selection of a remedy for contamination of a site which ensures adequate protection for human health and the environment.

Risk assessments utilize analytical data regarding concentrations of contaminants in various media (soil, water, etc.) at a site and estimate the risks posed by those contaminants to humans and to the biological community. It is not possible to assess risk in all conceivable scenarios involving human and animal exposure to contamination. Accordingly, risk assessments are performed using assumptions about human and animal behavior and using representative or sensitive animal species as surrogate models to represent the hundreds of different species that may be present at a site. The assumptions which are used in the assessments are crucial to the nature and degree of risk found.

The appropriate assessment of potential risks to humans and the environment is implemented by application of guidance documents promulgated by the United States Environmental Protection Agency ("USEPA") and other governmental entities. USEPA designates certain contaminated sites as National Priority List ("NPL") sites under CERCLA. Onondaga Lake has been so designated. For NPL sites in New York State that are also designated inactive hazardous waste disposal sites under the New York Environmental Conservation Law by the New York State Department of Environmental Conservation ("NYSDEC"), such as Onondaga Lake, guidance documents promulgated by NYSDEC apply, in addition to USEPA guidance. Guidance documents for risk assessment generally envision the

use of conservative assumptions so as to avoid understating risks to humans or the environment.[2]

II. HONEYWELL'S DUTY TO COMPLY WITH CERCLA GUIDANCE DOCUMENTS

The Consent Decree and its subsequent amendments require that Honeywell comply with CERCLA guidance documents in performing RI/FS work at the Site. The Consent Decree provides that "CERCLA, the NCP and CERCLA guidance documents apply to releases of hazardous substances as defined in CERCLA." Consent Decree ¶ 22. The "terms and conditions of the Consent Decree" (subject to exceptions not relevant here) apply to RI/FS work at the Site. Stipulation and Order ¶ 6.

III. THE STATE'S PERFORMANCE OF THE RI/FS

Under the Consent Decree, as amended, Honeywell is obligated to prepare and submit various RI/FS reports to the State. The State may disapprove any Honeywell submittal and notify Honeywell of its objections in writing. Consent Decree ¶ 31. Following such notification, Honeywell must perform any necessary additional work "in accordance with the State's comments and shall submit a revised submittal" to the State. *Id.* The State may disapprove a revised submittal and issue its own report which may include "revision of assessments, evaluations and conclusions [of Honeywell]. . . as deemed necessary by the State. . . " *Id.* ¶ 32. Similarly, the State may expand the scope of the work to be performed by Honeywell if data or

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[2] *See, e.g.*, "Risk Assessment Guidance for Superfund, Volume I--Human Health Evaluation Manual (Part A)," United States Environmental Protection Agency (1989) (hereinafter "USEPA 1989"), p. 6-5 (human health risk assessment must be "conservative" by considering the "reasonable *maximum* exposure"of humans to contamination) (emphasis added); "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (Interim Final)," United States Environmental Protection Agency (1997) (hereinafter "USEPA 1997"); at p. 7-4 (lower bound threshold for estimating adverse ecological effects should be based on "conservative assumptions").

other information generated in the RI process, or otherwise obtained by the State, indicate that such additional work is necessary to meet the objectives of the RI/FS process. *See, e.g.*, Consent Decree ¶ 33.

IV. THE STATE'S DETERMINATIONS CONCERNING THE RI, BERA AND HHRA REPORTS

A. Background

Honeywell submitted its original RI Report on May 29, 1998, and its original BERA and HHRA Reports on May 14, 1998. After extensive review, the State disapproved the reports in writing; the RI Report by letter dated August 3, 1999; the BERA Report by letter dated March 15, 1999; and the HHRA Report by letter dated October 2, 1998. The State's disapproval letters articulated the various bases for its disapprovals, and instructed Honeywell as to how the reports should be revised.

After making revisions, Honeywell re-submitted the HHRA Report on March 23, 2001, and the RI and BERA Reports on April 20, 2001. The State's subsequent review of the revised Honeywell Reports has included consideration of Honeywell's responses to the State's comments concerning the previously disapproved reports, discussions with Honeywell and its consultants, comments from USEPA Region 2 staff, the New York State Department of Health and Onondaga County, and the State's application of generally accepted scientific principles based on its experience in overseeing remedial investigations.

Upon further review, the State concluded that the Honeywell Reports were still not approvable. In addition, as the State developed a greater understanding of the Site through the ongoing investigations, the State concluded that it should undertake further data gathering and

analysis, and incorporate the results into the RI Report, in order to make that report an appropriate and comprehensive predicate for the upcoming FS. The State's Revision of the Honeywell RI Report incorporates the results of this additional data gathering and analysis.

By letter dated July 24, 2001, the State advised Honeywell of its decision not to approve the revised Honeywell Reports. The parties subsequently stipulated, and the Court ordered, that the State would issue formal determinations disapproving and revising the Honeywell Reports by December 31, 2002.

B. Bases For The State's Determination Concerning The RI Report

The reasons the State disapproves the Honeywell RI Report, and determines that the State's Revision of the Honeywell RI Report is the approved RI Report, include the following:

1. Honeywell's RI did not adequately evaluate and discuss the fate and transport of mercury within the lake. The State revised the RI to adequately evaluate and discuss the fate and transport of mercury within the lake.

Honeywell's revised RI Report failed to adequately evaluate and discuss the fate and transport of mercury within the lake. Simply put, this refers to how and to what extent mercury is moving about in the lake – where mercury is coming from, where it is ending up, and how it is getting to that destination.

To take one example, Honeywell's revised report inappropriately minimized the importance and quantity of mercury release from sediments (submerged soils on the bottom of the lake). This was also a problem with Honeywell's original RI Report, which the State reviewed in 1999. At that time the State instructed Honeywell to modify the RI Report to adequately assess this important aspect of the lake's mercury budget.

While isolation of the hypolimnion [the lower waters of the lake] during summer

minimizes mercury loss to the epilimnion [the upper waters] and lake outlet during the summer, the fall turnover[3] represents a means of export of this mercury to points downstream of the lake. Thus this sediment-to-water column load must be considered in the lake mercury balance and the text must be appropriately modified to indicate its importance.

(State's RI Comment Letter, August 3, 1999 [bracketed information added].)

Page 5-26, Subsection 5.1.1.6. Second sentence is incorrect. No accounting for the large gain in the summer hypolimnetic mercury inventory is presented in this chapter. Without incorporating this additional load, any statements summarizing the total load to the lake are wrong. The additional load presumably originates with the sediments and represents a means of mercury release from the lake to waters downstream and cannot be ignored. The subsequent discussions in the paragraph summarizing AlliedSignal's largely unconstrained calculations concerning groundwater and diffusion are inappropriate, and should be removed, given their uncertainty and the demonstrated gain in hypolimnetic mercury during summer stratification.

(State's RI Comment Letter, August 3, 1999.)

Page 8-2, Section 8.2.1. This section fails to account for the sediment release of mercury as does the rest of the report. This is a critical exclusion since the apparent load places the sediments in an important role. This section also needs to place the loads in some context to show that external mercury loads are dominated by AlliedSignal (via Ninemile Creek and the East Flume) and Metro, with background tributary loads and atmospheric deposition accounting for one third or less during the period of study.

(State's RI Comment Letter, August 3, 1999.)

Despite these instructions, Honeywell's revised RI Report continued to inappropriately minimize the importance and quantity of mercury that is released to water from sediments in the

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[3] The "fall turnover" is an annual phenomenon in Onondaga and some other lakes. During the warm summer months the waters of Onondaga Lake tend to form layers that do not mix, with the boundary between the two layers known as the thermocline, because of the extreme temperature difference between the warmer layer closer to the surface and the colder one below. This layering effectively prevents the lower layer from mixing with, and being aerated by, the better-aerated surface waters. As bacteria and other organisms use up the available air supply in the capped lower layer, it becomes anaerobic. In the fall the layering subsides, the layers in the water column mix, and the previously anaerobic water disperses. This is known as the "fall turnover."

lake, instead asserting that sediments are a minor source. As illustrated by the data collected by Honeywell during the course of the RI, this is not correct: sediments are an important source of mercury to overlying waters. For example, as explained in the State's Revision of the Honeywell RI Report at Chapter 6.1, during the summer period of lake stratification, when the hypolimnion, or lower waters are effectively sequestered from the epilimnion, or upper waters, the sediments are the major source of mercury to the hypolimnion. This is important not only to understanding the total mercury budget of the lake, but also to understanding the fate and transport of methylmercury, the most toxic and bioaccumulative form of mercury. Accordingly, the State revised the RI Report to accurately characterize the importance of mercury release from sediments, particularly at Chapter 6.

2. **Honeywell's RI did not adequately evaluate and discuss the fate and transport of non-mercury contaminants within the lake. The State revised the RI to adequately evaluate and discuss the fate and transport of non-mercury contaminants within the lake.**

Honeywell's original RI did not adequately evaluate and discuss the fate and transport of non-mercury contaminants within the lake. For example, Honeywell's original RI Report failed to adequately discuss the loading of non-mercury contaminants such as benzene, toluene, and xylenes (BTX) and chlorinated benzenes to the lake. The State instructed Honeywell to revise the RI to adequately address these issues.

> Page 5-31, third paragraph. The text needs to include a discussion of the I-690 drainage loads of chlorinated benzenes and other compounds detected at significant levels in the system's discharge. As part of this, the text will need to indicate load ranges for various flows for this source. As per the Work Plan (PTI, 1991), an estimate of the total chlorinated benzenes load to the lake should also be included, considering all external sources (e.g., tributaries, point sources, groundwater) as well as internal (e.g., sediment releases, dechlorination or transformation) sources (see page 167 of the Work Plan). The Work Plan (page 169) also identified calculating loading rates of BTX compounds for the

lake (external and internal), which should be performed and included in the revised RI Report.

(State's RI Comment Letter, August 3, 1999.)

Despite these instructions, Honeywell's revised RI failed to adequately evaluate and discuss the fate and transport of non-mercury contaminants in the lake. Therefore, the State modified the RI Report to include an adequate evaluation and discussion of these issues, including the contribution of contaminants via tributaries and groundwater loading, discussed below. These issues are discussed in detail in the State's Revision of the Honeywell RI Report at Chapters 4, 5 and 6.

3. Honeywell's RI did not adequately evaluate and discuss the nature and impact of groundwater discharges to the lake. The State revised the RI Report to adequately address these discharges.

Honeywell's original RI did not adequately address the nature and impact of discharges of contaminated groundwater to the lake. The State therefore instructed Honeywell to modify the RI to adequately address this important issue.

> Page 4-51, Section 4.5. The discussion of groundwater is much too brief here and requires much more discussion and analysis. Groundwater is potentially an important transport means for many contaminants entering the Lake and thus its characterization must be presented here and not simply cited from another report. At a minimum, identify (or tabulate) the primary COCs [contaminants of concern] in groundwater at each of the sites, provide summary statistics for each parameter and compare groundwater concentrations to groundwater criteria.

(State's RI Comment Letter, August 3, 1999.)

Despite these instructions, Honeywell's revised RI Report continued to inadequately address groundwater discharges to the lake. Honeywell presented a very simplistic discussion of groundwater discharges and failed to adequately quantify the contribution of contaminants to the

lake via the groundwater pathway. Therefore, the State revised the RI to adequately address these inputs. Groundwater discharges are discussed in detail at Chapter 6 of the State's Revision of Honeywell's RI Report.

4. **The State revised the RI Report to include extensive discussion of in-lake deposits of Honeywell waste material in the southwestern corner of the lake. Honeywell's revised RI Report failed to discuss these deposits.**

The State revised the RI Report to include extensive discussion of in-lake deposits of Honeywell waste material in the southwestern corner of the lake. Information and data reviewed by the State indicate that Honeywell disposed of millions of cubic yards of waste directly into the lake from before 1938 and through at least 1951. Furthermore, these in-lake waste deposits serve as a major on-going and uncontrolled source of contaminants to the lake and its biota. Yet, Honeywell's RI Report did not discuss Honeywell's in-lake disposal of waste. The State therefore revised the RI to include extensive discussion and analysis of the in-lake waste deposits in the southwestern corner of the lake, particularly at Chapters 4, 5, 6 and 9.

C. Bases For The State's Determination Concerning The BERA Report

The reasons the State disapproves the Honeywell BERA Report, and determines that the State's Revision of Honeywell's BERA Report is the approved BERA Report, include the following:

1. **Honeywell's BERA excluded important data, resulting in the development of toxicity indices that were not sufficiently protective of the environment. The State revised the toxicity indices to be sufficiently protective of the environment, based upon all appropriate data.**

Part of the BERA included the development of several sets of "sediment toxicity indices." These indices quantify levels of particular COCs in the sediment at which adverse biologic

impacts on the selected ecological receptors will likely occur. Sediment toxicity indices are one way of determining if and at what concentrations contamination in sediments is likely to have deleterious effects on the biota of the lake. For example, an index of 2.0 parts per million (ppm) mercury would indicate that a deleterious effect would be expected to occur at a sediment mercury concentration of 2.0 ppm or greater. Conversely, deleterious effects would not be expected to occur at a contamination level below 2.0 ppm of mercury.

The State identified several aspects of the sediment toxicity indices developed by Honeywell that were seriously flawed. Honeywell improperly excluded certain sediment toxicity data from the development of these indices, resulting in values that were up to six times greater than those developed by the State. As noted above, contamination levels below the index values would not be expected to cause deleterious effects. An inappropriately inflated (*i.e.*, high concentration) index would lead one to incorrectly conclude that no effects would be expected at any level below the index value. For example, if a site-specific sediment toxicity index was incorrectly determined to be 2.0 ppm when it should have been calculated to be 1.0 ppm, the sediment clean-up level could be set at 2.0 ppm for that contaminant concentration, based on the sediment toxicity index. However, adverse biological effects could still occur because the actual no-effect level was 1.0 ppm (*i.e.*, organisms exposed to contaminant concentrations between 1.0 and 2.0 ppm left in the sediment after clean-up could be adversely affected). Therefore, inappropriately high sediment toxicity indices are not adequately protective of the environment.

Two of the indices that were developed are the Effects Range Low (ER-L) and the Effects Range Median (ER-M). Scientists use data on the concentrations of COCs, coupled with laboratory toxicity studies, to develop these values on a site-specific basis. The ER-L is the

lower 10 percentile of chemical data associated with biological effects, and the ER-M is the median. In general, chemical concentrations below the level of the ER-L in sediment are not likely to have adverse effects on animals that live in sediment, while concentrations of contaminants above the level of the ER-M in sediment probably have adverse effects on animals that live there. Honeywell developed toxicity data for 35 sample areas in Onondaga Lake. However, Honeywell used data from only 16 areas in the development of the ER-L and ER-M values. The areas that Honeywell excluded from its analyses are those where, for the most part, adverse effects were observed at mercury concentrations lower than those observed in the areas that Honeywell chose to include in its analyses. This selective use of data resulted in the development of toxicity indices that were artificially inflated and skewed in a direction that was not adequately protective of the environment.

The State therefore revised these indices using the full compliment of available data, developing values that were several times lower than those developed by Honeywell. For mercury, the State's ER-L concentration is 0.5 parts per million (ppm), while Honeywell's is 3.2 ppm; the State's ER-M concentration is 2.8 ppm, while Honeywell's is 11.2 ppm. The State revised the BERA to use the State-derived, appropriately protective indices, particularly at Chapter 9.

2. Honeywell used inappropriate sediment toxicity values in the BERA. The State revised the BERA using appropriately conservative values.

As part of the BERA, Honeywell was to develop site-specific sediment toxicity values, termed Onondaga Lake Sediment Quality Values (OLSQVs) by Honeywell, based in part on the indices described in C.1. above. In meetings with the State, Honeywell proposed to develop both

"primary" and "secondary" OLSQVs. The State rejected such an approach because sediment quality criteria must be conservative and protective of the environment; there is no basis in risk assessment for providing tiered levels of biological effects. As the State informed Honeywell in January of 2001:

> In addition, the Department rejects the designation of "primary" OLSQVs and "secondary" OLSQVs. There is no basis for such a designation. The sediment quality criterion selected should be based on the lowest COI concentration that shows a statistically significant biological effect, regardless of which of the five tests showed the effect (*Hyalella* acute, *Hyalella* chronic, chironomid acute, chironomid chronic, benthic community analysis).

(E-mail from Timothy Larson, NYSDEC, to Al Labuz, Honeywell, January 25, 2001.)

Despite this instruction, Honeywell reported two OLSQVs in the revised BERA Report. Honeywell's primary OLSQVs were developed to predict the potential presence of lethal toxicity (*i.e.*, death of animals), whereas secondary OLSQVs were developed to predict the potential presence of sublethal toxicity (*e.g.*, reproductive or growth effects). In order to be sufficiently protective of the environment, and consistent with the State's instructions to Honeywell, the State revised the BERA using only chronic sublethal sediment effect concentrations. The State's development of sediment effect concentrations is discussed in detail at Chapter 9 of the State's Revision of Honeywell's BERA Report.

3. Honeywell did not comply with USEPA requirements for performing a "probabilistic assessment" – a certain type of risk assessment – in the BERA.

Ecological risk assessment is a mathematical evaluation of whether and to what degree contaminants in the environment pose a threat to ecological receptors. There are two approaches that may be followed in developing such an assessment; deterministic assessment and probabilistic assessment. Deterministic assessment involves a fairly straightforward

mathematical approach to modeling exposure of receptors to COCs. In contrast, probabilistic assessment is a much more complex process that involves thousands of runs of computer models that seek to simulate the universe of possible exposure scenarios. Probabilistic assessment is often referred to as a "Monte Carlo" assessment. Given the complexity of the analysis, and the importance to the outcome of the various assumptions used in the modeling, USEPA guidance instructs that those attempting probabilistic analyses consult frequently with the government agencies overseeing the work. For example, USEPA guidance instructs that a work plan for the assessment must be approved by the agencies before it is undertaken. (USEPA, 1999, Risk Assessment Guidance for Superfund, Volume 3, Part A, Process for Conducting Probabilistic Risk Assessments.) Such consultation is necessary to ensure that the factors used in the assessment are sufficiently protective and that appropriate procedures are followed.

Honeywell performed a deterministic assessment in the original BERA. In developing its revised BERA, Honeywell also performed a probabilistic assessment. However, Honeywell developed the latter in contravention of USEPA guidance designed to ensure that this complex type of risk assessment is appropriately protective of the environment.

Honeywell failed to properly consult with the State as the assessment was being performed. While Honeywell did submit a work plan for this assessment to the State on March 30, 2001, Honeywell's revised BERA Report was due to be submitted less than one month later, on April 23, 2001. This left insufficient time for the State to thoroughly evaluate and comment on the plan. Consequently, Honeywell's work plan for the probabilistic risk assessment was not approved prior to implementation. Moreover, the review the State was ultimately able to undertake revealed that the Honeywell BERA did not provide sufficient information for the State

to re-create and evaluate the probabilistic exposure scenarios for all receptors.

Because Honeywell failed to follow USEPA guidance and failed to adequately consult with the State in developing the probabilistic risk assessment, the State excluded Honeywell's probabilistic assessment from the State's Revision of Honeywell's BERA, and included a deterministic risk assessment only.

4. Honeywell excluded data from Onondaga Lake surface water, collected by Honeywell in 1999, from the BERA. The State modified the BERA to include these and all other appropriate data.

Honeywell's original BERA excluded some relevant data collected for the Onondaga Lake RI. The State instructed Honeywell to use all relevant data in revising the BERA.

> The BERA should include and be based upon all appropriate data collected as part of the Remedial Investigation (RI) as well as other appropriate data (e.g. Data from Upland AlliedSignal Sites and NYSDEC Biota Data). The RI included extensive sampling and data gathering activities, generating a large volume of potentially important information. The Draft BERA inappropriately relies upon only a subset of the data collected during the RI, excluding data and information from several studies performed explicitly as part of the ecological risk assessment portion of the RI.

(State's BERA Comment Letter, March 15, 1999.)

As part of the RI, Honeywell collected, among other data and information, additional surface water data from Onondaga Lake in the fall of 1999. Honeywell's revised BERA excluded these data, providing no justification for such exclusion. The State re-performed the BERA using these and all other appropriate data.

5. Honeywell inappropriately utilized the herbivorous muskrat as the representative small mammal prey species to model impacts on carnivorous species that prey on small mammals. The State revised the BERA to exclude the muskrat data, and instead utilized the more conservative, environmentally protective insectivorous short-tailed shrew as the prey species.

In order to assess the risk to receptors feeding partially or completely on small mammals inhabiting the Site, such as the red-tailed hawk, the BERA estimates small mammal body burdens (*i.e.*, chemical concentrations in body tissues) and quantifies the likely impacts of that exposure on animals feeding on them.

Honeywell selected the herbivorous muskrat as the small mammal species upon which it based this part of the analysis, including data developed from its Geddes Brook/Ninemile Creek muskrat sampling in the revised BERA. Honeywell's reliance on the herbivorous muskrat as a surrogate for all small mammals was inappropriate. A herbivore cannot be used to represent the feeding strategies of insectivorous mammals, which are likely to have higher body burdens of contaminants, because insectivores eat food higher on the food chain that typically contains greater contaminant concentrations than plants. The State informed Honeywell of the need to rely on insectivores earlier in this case in the State's Determination to Disapprove and Revise the LCP Bridge Street Remedial Investigation Report:

> According to USEPA guidance, where contaminants at a site are known to bioaccumulate an insectivore (such as the shrew) should be chosen as the representative mammal for ecological risk assessment. A herbivorous mammal is exposed to contaminants through ingestion of plants, which are low on the food chain and therefore do not bioaccumulate contaminants at a high rate. Unlike the mouse, the shrew is an appropriate representative mammal because it is insectivorous, rather than herbivorous, and higher on the food chain. Insects and other invertebrates (e.g., snails and slugs), which make up the shrew's diet, tend to bioaccumulate contaminants more than the plants eaten by a mouse. Thus, an insectivorous mammal, such as the shrew, is likely to be exposed to more contamination than a herbivorous mammal, such as the mouse.

(State of New York's Determination to Disapprove and Revise the LCP Bridge Street Remedial Investigation Report, 1998.)

The State determined that for the Onondaga Lake BERA, an insectivore was therefore a more conservative and appropriate representative mammal species than the muskrat. Therefore, the State revised the BERA to evaluate threats to carnivorous birds and mammals feeding on the short-tailed shrew, as opposed to feeding on the muskrat. The State's analysis appears in the State's Revision of Honeywell's BERA Report at Chapter 8 and Appendix H.

6. The State revised the BERA to include data from the Macrophyte Transplant Study that Honeywell inappropriately excluded from its revised BERA Report.

Honeywell's original BERA Report did not include information and data developed from the Macrophyte Transplant Study, which was performed by Honeywell in 1992, with the results reported in Honeywell's 1993 Ecological Effects Report. The Macrophyte Transplant Study was designed to determine the extent to which representative macrophyte (aquatic plant) species can survive and grow in the sediment and water of the littoral zone (shallow near-shore waters) of Onondaga Lake, by comparing growth in Onondaga Lake to growth in a lake unaffected by contaminants like those in Onondaga. Honeywell planted three species of macrophytes at two depths in the littoral zones of Onondaga Lake and at an appropriate reference lake (Otisco Lake). The results of the study showed macrophyte survival to be minimal at Onondaga Lake, in contrast to Otisco Lake.

The State therefore instructed Honeywell to revise the BERA to include information and data from that study:

The results of the macrophyte transplant study are never clearly presented in the BERA.

These results should be clearly summarized.

(State's BERA Comment Letter, March 15, 1999.)

Despite this specific instruction, Honeywell excluded information and data from the Macrophyte Transplant Study from its revised BERA. The State revised the Honeywell BERA to include information and data from this study at Chapter 9.

7. Honeywell's BERA inappropriately combined soil and sediment data from all wetland areas to assess exposure to contaminated soils. The State re-performed the BERA separating out each wetland individually.

Honeywell collected wetland soil and sediment data in the summer of 2000 for use in the revised BERA to characterize concentrations of contaminants in each of these areas and risk to receptors living or foraging there. However, in developing the revised BERA, Honeywell inappropriately combined all of the soil and sediment data from the four wetlands and the dredge spoils area in calculating exposure and risks posed to ecological receptors. Each of these wetlands is a distinct area, and some are more contaminated than others. In addition, the home range of some ecological receptors, particularly small mammals (*e.g.*, short-tailed shrew), is sufficiently small such that individuals and whole populations might spend their entire lives in one wetland area. In order to more accurately assess the risk to small mammals, the State revised the BERA to address each wetland area individually. The State's treatment of each wetland area individually is discussed at Chapters 8 and 10 of the State's Revision of Honeywell's BERA Report.

8. Honeywell inappropriately combined all piscivorous fish together in performing the BERA. The State re-performed the BERA, separating out individual piscivorous fish species.

In the original BERA, Honeywell used fish data to estimate risks to avian and mammalian

receptors, but did not evaluate risks to the fish themselves from exposure to lake contaminants. In its revised BERA, Honeywell evaluated risks to fish in Onondaga Lake, but inappropriately combined all forage (prey) and piscivorous (fish-eating predator) fish data from Onondaga Lake together to assess risk. This is inappropriate, as different species of fish have different feeding strategies and life histories such that exposure to, and risks from, COCs differ between species. To remedy this deficiency in the BERA, the State re-performed the analyses on a species-specific basis for all fish for which sufficient data exist. Species evaluated individually included piscivorous fish such as the largemouth bass and walleye. Fish profiles and the results of this analysis are reported in the State's Revision of Honeywell's BERA Report at Chapters 8 and 10.

9. Honeywell selected an inappropriately small set of COCs, and failed to justify its selection with adequate information. The State modified the BERA to use appropriate criteria in selecting COCs, resulting in an expanded, appropriately supported set of COCs.

Honeywell's original BERA Report did not provide sufficient detail on many aspects of the assessment, including the selection of COCs. The State instructed Honeywell to include more detail in the revised BERA Report.

> One fundamental problem with the Draft BERA is that very little information is provided to support AlliedSignal's statement (page 1-1 of the Draft BERA Report) that AlliedSignal conducted the Risk Assessment consistent with Step 1 (as described in "Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (FWIA), NYSDEC 1994) and Steps 1 through 6 (as described in "Ecological Risk Assessment Guidance for Superfund: Interim Final", USEPA June 1997 (ERAGS)). ... The revised Draft BERA must include FWIA Step 1 and ERAGS Steps 1 through 6, including appropriate documentation, rationale and level of detail.

(State's BERA Comment Letter, March 15, 1999.)

At a meeting on March 13, 2001, the State reiterated these instructions, specifically telling Honeywell that the BERA should provide adequate detail on the selection of COCs.

Despite these instructions, Honeywell's revised BERA Report provided inadequate information concerning its selection of COCs, preventing a reasoned evaluation of whether Honeywell had chosen an appropriate suite of chemicals that could present risks to the ecological receptors.

The State therefore re-evaluated and then modified Honeywell's deficient selection criteria for the BERA, in order to be appropriately conservative and protective, and provided a detailed discussion of the State's bases for selecting COCs. Use of the State's modified selection criteria resulted in the State's selection of several additional COCs. For example, the State selected several additional COCs for sediment, including the pesticides chlordane, dieldrin, and DDT, and the inorganic contaminants arsenic, silver, and vanadium. The selection of COCs is discussed in detail at Chapter 6 of the State's Revision of Honeywell's BERA Report.

10. Honeywell utilized inappropriate reference sites in the BERA. The State revised the BERA using appropriate reference sites.

One aspect of ecological risk assessment involves comparing conditions at the site being assessed (in this case, Onondaga Lake) with conditions at uncontaminated reference areas. Honeywell's revised BERA used several areas as reference areas, comparing conditions in Onondaga Lake to conditions at these sites. However, some of the reference areas chosen by Honeywell were inappropriate because they were not in "clean," upstream areas. Indeed, some of the reference areas chosen by Honeywell are impacted by COCs. The State had previously rejected Honeywell's choice of one of these specific areas as a reference site for the Geddes Brook /Ninemile Creek RI/FS:

> The reference station (NM1) used in the BERA, which was used to compare benthic metrics, does not appear to be an appropriate reference station based on the fact that NM1 is an impacted location from a benthic community analysis standpoint. The macroinvertebrate community is limited to a few tolerant species, with oligochaetes

(worms) comprising about 89% of the individuals and midges making up about 9% of the total individuals. Therefore, use of this station as a reference station (which should be a non-impacted station) is inappropriate as its use could lead to incorrect conclusions. Results should be compared to an appropriate location in Ninemile Creek or NYSDEC values for a healthy river system (NYSDEC, 1993).

(State Comment letter regarding Geddes Brook/Ninemile Creek RI/FS Draft BERA Report, November 17, 2000.)

Because Honeywell utilized inappropriate reference sites in its revised BERA, the State revised the BERA using appropriate reference areas. Reference areas used by the State are discussed in the State's Revision of Honeywell's BERA Report at Chapter 11.

11. The State revised Honeywell's BERA Report to more accurately characterize Onondaga Lake and its environs.

The revised Honeywell BERA Report did not adequately describe the ecological conditions of Onondaga Lake and its environs. For example, the report understated the disturbed nature of the fish species assemblage in the lake, and failed to sufficiently address the stressed condition of amphibian populations in the lake and lake-connected wetlands. Further, Honeywell failed to obtain a current letter from the NYSDEC Natural Heritage Program detailing sensitive habitats in or near Onondaga Lake. Such a letter is required under NYSDEC guidance. ("Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites," NYSDEC 1994.) Honeywell's original BERA Report also did not include such a letter. The State instructed Honeywell to include the requisite letter in the revised BERA Report.

> Consistent with the FWIA, the revised BERA report should include: a current (i.e., within the last year), dated copy of a letter from the Natural Heritage Program discussing areas containing sensitive habitats or elements in or within the vicinity of the Onondaga Lake system. A map of these areas should be included pursuant to Natural Heritage Program instructions on how to represent them for public review without revealing in detail the specific location(s).

(State's BERA Comment Letter, March 15, 1999.)

Despite these instructions, Honeywell's revised BERA Report did not include such a letter, although it did include an outdated Natural Heritage Program letter for an adjacent site, the Geddes Brook/Ninemile Creek site. To remedy these and other omissions and mischaracterizations, the State revised the BERA Report to provide a fuller description of the relevant ecological conditions of Onondaga Lake and its environs, and to include current Natural Heritage Program and US Fish and Wildlife Service letters discussing sensitive habitats and threatened and endangered species for the Onondaga Lake site. *See* State's Revision of Honeywell's BERA Report, at Chapter 3 and Appendix C.

D. Bases For The State's Determination Concerning The HHRA Report

The reasons the State disapproves the Honeywell HHRA Report, and determines that the State's Revision of Honeywell's HHRA Report is the approved HHRA Report, include the following:

1. Honeywell inappropriately excluded fish data from the HHRA. The State revised the HHRA to include all appropriate data.

Honeywell excluded a specific subset of fish contaminant data from the revised HHRA. This set of data was developed from fish collected in the lake near the mouth of Ninemile Creek and along the southwestern shoreline of the lake between the mouths of Tributary 5A and Harbor Brook in 2000. While this data set does appear in Honeywell's listing of data sets purportedly used in the HHRA, the actual data were not used in the risk calculations that Honeywell performed.

After identifying this exclusion, the State revised the HHRA to include the missing data.

The State reached different conclusions, because the data that Honeywell had excluded from its analysis showed that the fish were heavily contaminated. For example, the State found the risk posed by dioxins/furans in fish to be markedly greater than did Honeywell. Also, inclusion of these data resulted in the State identifying several additional Contaminants of Potential Concern (COPCs), such as the inorganic contaminants arsenic, cyanide, manganese, vanadium, and zinc, and the pesticide aldrin. The State's identification of COPCs is discussed in the State's Revision of Honeywell's HHRA Report at Chapter 3, and the risks posed by dioxins/furans are discussed at Chapters 6 and 7.

2. Honeywell's HHRA failed to adequately address the possibility of subsistence fishing on Onondaga Lake. The State revised the HHRA to adequately address the issue of possible subsistence fishing.

Subsistence fishing is when anglers or their families consume quantities of fish the anglers catch as a significant part of their normal diet. There are several reasons that people fish for subsistence, including economic and cultural factors. In the original HHRA Report, submitted by Honeywell in May 1998, Honeywell failed to adequately address the possibility of subsistence fishing on Onondaga Lake. The State therefore instructed Honeywell to evaluate the potential risk to subsistence anglers in the revised HHRA.

> Conversely, there is no evidence that a subsistence angler population does not exist in the Syracuse area. The text should be modified and this potential risk <u>should</u> be evaluated.

(State's HHRA Comment Letter, October 2, 1998.)

Despite this instruction, Honeywell's revised HHRA failed to adequately address the subsistence angler issue. Honeywell basically dismissed the possibility that such a population - or individual - could exist. The State modified the HHRA to thoroughly discuss the possibility

that subsistence angling could occur on Onondaga Lake, including the factors that go into such an evaluation, such as local demographics. This issue is discussed in the State's Revision of Honeywell's HHRA Report at Chapters 2, 4 and 7.

3. **Honeywell's revised HHRA Report contained a number of statements that mischaracterized the nature of risk assessment in general, and the risks posed by Onondaga Lake in specific. The State revised the HHRA to appropriately characterize the risk assessment process and the particular risks posed by Onondaga Lake.**

At a number of places in its revised HHRA Report, Honeywell mischaracterized the nature of risk assessment. For example, the revised HHRA Report repeatedly asserts that the use of a Reasonable Maximum Exposure (RME) scenario "overestimates true exposure," implying that such an assessment is inappropriate. The RME scenario is used in risk assessment to evaluate the risk a site poses to someone who might be exposed to contamination at the high end of expected frequency of usage. As such, conservative, high-end estimates of various exposure factors, such as frequency of contact with soils and frequency of fish consumption are used. The RME scenario is designed to reflect a highly exposed individual whose exposure is still within the range of actual potential exposures. Such a scenario is appropriate in performing risk assessment, where conservative assumptions are required in order to be adequately protective. The State's Revision of Honeywell's HHRA Report was revised to remove mischaracterizations of the risk assessment process.

Honeywell's revised HHRA Report mischaracterized the fundamental nature of uncertainty in risk assessment. Honeywell repeatedly characterized the uncertainties in the HHRA as likely to overestimate risk. This is not true; uncertainties lead to error, and conservative assumptions are used to compensate for uncertainties in the HHRA analyses.

Uncertainties may result in the calculated risks being greater than or less than the actual risks. The State revised Honeywell's HHRA Report to characterize uncertainty in risk assessment appropriately.

Honeywell's HHRA Report also mischaracterized the effects of NYSDOH consumption advisories on the risk posed by consumption of fish from Onondaga Lake. The NYSDOH currently recommends that women of childbearing age and children consume no fish from Onondaga Lake, and that all others severely limit such consumption. Honeywell's HHRA Report suggests that these advisories reduce the risk posed by the consumption of fish from the lake. This is not so; the risk posed by consumption of contaminated fish is not ameliorated by NYSDOH advice against such consumption. Whether the NYSDOH advises against consumption of fish from Onondaga Lake, and whether people are aware of or heed the advice, does not affect the threat the contaminated fish pose. The risk posed by the contaminated fish still exists, and consumption of such fish is still possible. The State removed such mis-characterizations from the State's Revision of Honeywell's HHRA Report.

4. The State revised the HHRA Report utilizing new information and data that were unavailable when Honeywell's revised HHRA Report was prepared.

The State has collected additional data and information on Onondaga Lake and surrounding environs since Honeywell developed its revised HHRA Report. For example, the State performed supplemental soil and sediment sampling in wetland SYW-6 in 2002, and used the resulting data to evaluate the possible risks the soils and sediment might pose if people, particularly children, come into contact with them. Because this additional data and information was not available for inclusion in Honeywell's revised HHRA, the State has revised the HHRA

to include this additional data and information. This new additional data and information is discussed in the State's Revision of Honeywell's HHRA Report at Chapter 3.

V. CONCLUSION

For the above-stated reasons, the State has disapproved and revised the Honeywell Reports, and determines that the State's Revisions of Honeywell's RI, BERA and HHRA Reports are the approved RI, BERA and HHRA Reports for the "Onondaga Lake System," under the parties' current operating definition.

Dated: Albany, New York
December 31, 2002

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